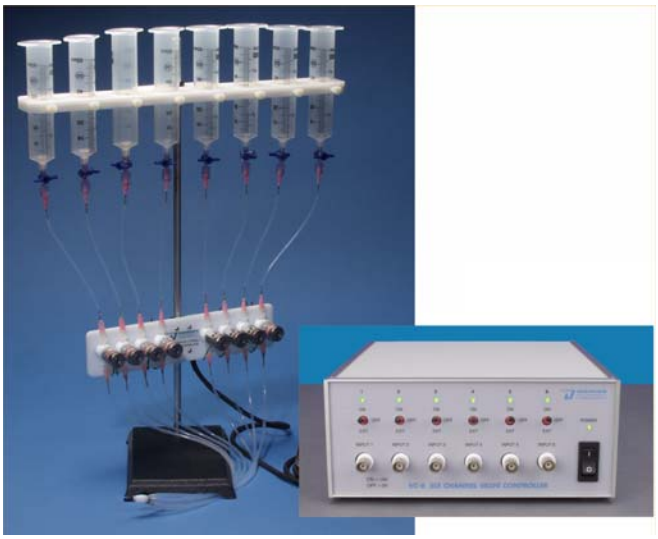
Warner Instruments
Perfusion Valve Control System
Model VC-6T



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The **VC-6T** Valve Control System lies at the heart of a multi-valve perfusion system designed to automate and control the delivery of solutions to Warner Instruments imaging and recording chambers. In addition, its flexible design allows the **VC-6T** to be used in many applications not using Warner equipment.

Features include:

- ✓ **PTFE valves**
- ✓ **6 channels, individually controlled**
- ✓ **Computer controllable**

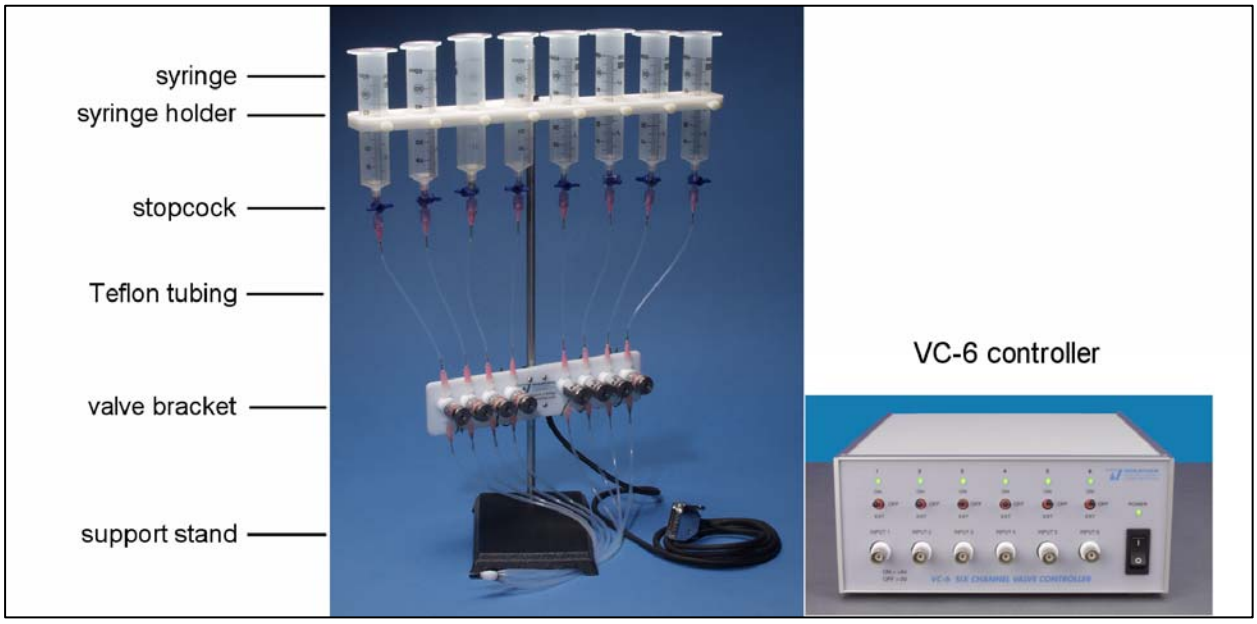
The complete system includes a valve controller, a valve bracket with PTFE valves, connecting cable, an **MPP-6** manifold, a support stand, syringe holder, six 60 cc syringes, 25 feet of PTFE tubing, 10 feet of **PE-160**, 18 blunt-ended 18-gauge syringe needles, and 6 stopcocks.

The controller can independently regulate the function of up to six valves. Individual valves can be controlled via manual switch, an external analog signal or an external digital (TTL) signal. An event marker pulse, generated each time a valve is switched on, is provided at the rear of the instrument for recording into your acquisition system. Valve transitions (opened or closed) occur at full power to insure rapid response times and are then held in place at less than half power to prevent heat transfer to solutions.

SETUP

Components

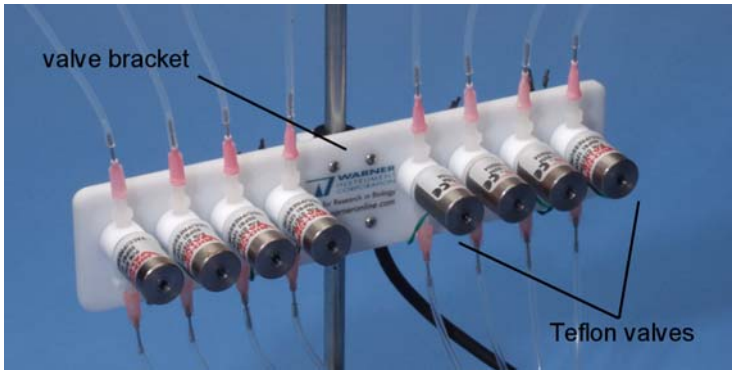
Before beginning setup, take inventory of the supplied components. You should have a valve bracket with included PTFE valves, a syringe holder, a support stand, 18 blunt-end syringe needles, stopcocks (6), PTFE tubing (25 ft), **PE-160** tubing (10 ft), an **MPP** 6-port manifold, and a **VC-6 Valve Controller**.



The **VC-6T** is designed to operate as a *stopped-flow* device wherein the valve for each channel is either open (allowing solution to flow) or is closed. In general, the shortest response time for delivery of the selected solution will be achieved by keeping the tubing length between the MANIFOLD and sample as short as possible.

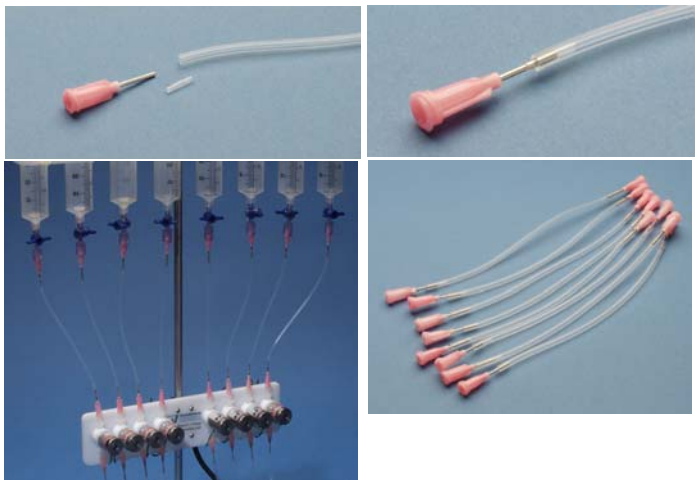
Assembly

1. Begin assembly of the **VC-6T** by first attaching the VALVE BRACKET to the SUPPORT STAND. Place the VALVE BRACKET near the base of the SUPPORT STAND as shown above.
2. This is followed by attaching the SYRINGE HOLDER to the top of the SUPPORT STAND. Place the SYRINGE HOLDER near the top of the SUPPORT STAND as shown above.
3. Remove the plungers from the six supplied 60 cc syringes and place the syringes into the SYRINGE HOLDER. Attach STOPCOCKS to each syringe.



4. Cut six (6) pieces of PTFE tubing long enough to run from the stopcocks to the *input ports* on the PTFE valves.

5. Attach one (1) blunt-end, 18-gauge syringe needle to both ends of each length of PTFE tubing to provide Luer connection points. Insert a short section of **PE-160** onto the needle tip to facilitate a tight seal between the PTFE tubing and the syringe needle.

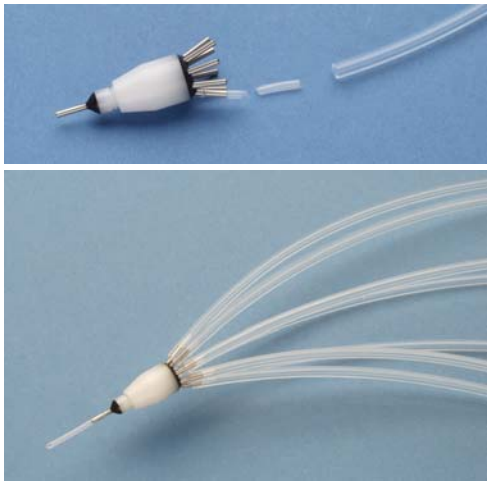


6. Using the Luer-ended PTFE tubes formed in step 5, make a connection between the stopcock on each syringe to the associated *input port* on each PTFE valve. Proper tubing lengths, Luer connector attachments, and tubing placements are shown in the montage above.

7. Cut six (6) pieces of PTFE tubing to run from the *output ports* of the PTFE valve to the supplied **MPP** manifold. The required tubing length is left to the discretion of the user but should be sufficient to allow for a short connection between the manifold and the sample chamber.

8. Attach the remaining blunt-end syringe needles to one end of each section of PTFE tubing.

9. Prepare the **MPP** manifold to accept the PTFE tubing by first sliding a short length of **PE-160** tubing over the *input ports* on the **MPP** manifold.



10. Now make a connection between the *output port* on <u>each</u> PTFE valve and one *input port* on the **MPP** manifold. Connection should be made using the PTFE tubing described in step 7. Attach the Luer fitting to the valve and the open end to the manifold.

11. Run a short length of **PE-160** tubing from the *output port* on the **MPP** manifold to the *input port* of sample chamber.

    NOTE: If desired, you can also run PTFE tubing between the manifold and your chamber. Prepare the manifold to accept the PTFE tubing by first sliding a short length of **PE-160** tubing over the output port on the **MPP** manifold.

12. Finally, connect the VALVE MANIFOLD to the **VC-6** CONTROLLER using the attached cable.

CONTROL DESCRIPTION

Front panel

The front panel of the **VC-6 Valve Controller** contains TTL inputs for each valve, an associated 3-position toggle switch for manually setting the state of each valve and an LED displaying the active status for each valve. There is also a 3-position toggle switch for selecting the *command input mode* and a power switch with power on LED.

Command input toggle

A COMMAND INPUT TOGGLE SWITCH is provided for each of the 6 channels of the **VC-6 Controller** to allow selection between internal and external commands.

Placing a COMMAND INPUT TOGGLE SWITCH into the *on* position drives the associated valve into its open state. A *lit* LED indicates the open state of the valve. In a similar manner, placing a COMMAND INPUT TOGGLE SWITCH into the *off* position drives the associated valve into its closed state. An *unlit* LED indicates the closed state of the valve.

TTL Inputs

TTL inputs (front panel BNC's) are provided for external control for each valve channel. Use of these inputs can allow for the simultaneous opening of more than one valve from a digital source (e.g., a computer).

Placing a COMMAND INPUT TOGGLE SWITCH into the *ext* position activates the associated TTL BNC input. A logic level *low* (0 V) applied to the BNC places the associated valve into the *closed* state. Correspondingly, a logic level *high* (3-5 V) places the associated valve into the *open* state. A lit and an unlit LED indicates the open and closed states of the valve, respectively.

Rear Panel

The rear panel contains the power input module with fuse, an EVENT MARKER OUTPUT, and a 15 pin D-connector for the VALVE CONTROL BRACKET.

To Valves

A 15 pin, "D" type female connector is used to connect the cable from the VALVE BRACKET to the CONTROLLER.

Event Out

The Event Marker output produces a 500 ms logic-level output (+5 V) each time a valve is turned on. At all other times the Event Marker output is low (0 V).

Power input module

A polarized, 3-conductor, IEC320/CEE-22 connector is used for line (mains) power input to the instrument. A removable cordset, terminated with a NEMA 5-15P connector, is standard. A fuse holder contains a protective fuse in series with the high side (brown or black wire) of the mains. The holder accepts 5 x 20 mm fuses of the type indicated.

INSTRUCTIONS FOR USE

Flow Adjustment

Flow rates can be adjusted by raising or lowering the reservoir holder, as well as by adjusting the height of each reservoir within the holder.

The table below lists the approximate flow rates for a reservoir at the specified height with the supplied PTFE tubing.

Reservoir height	Approximate flow rate
61 cm (24 in.)	14 ml/min
30 cm (12 in.)	9 ml/min
20 cm (8 in.)	5 ml/min

APPENDIX

Maintenance

Cleaning

Do not use alcohol, aromatic hydrocarbons or chlorinated solvents for cleaning. They may adversely react with the plastic materials used to manufacture the system. If salt solution spills on the valve assembly it should be cleaned as soon as possible with a soft cloth dampened with a mild solution of detergent and water.

NOTE: PTFE Valves must be completely flushed with distilled water after each use. Permanent damage will result if saline solution is allowed to crystallize inside the valve.

The exterior of the CONTROLLER may be cleaned periodically to remove dust, grease and other contamination. It is not necessary to clean the inside. Use a soft cloth dampened with a mild solution of detergent and water. Avoid abrasive cleaners.

Stuck or leaky valves

One possibility for a stuck valve is that the valve assembly was not completely flushed out at the end of the day. While excessive salt build-up can result in a stuck valve, a more significant condition is the potential formation of small pits in the valve seals, which will result in a leaky valve.

A valve bound with salt can be loosened by flushing with warm water to see if the crystals will dissolve or loosen. ETOH may be used for sticky buildups and dilute acetic acid may be used to loosen any mineral deposits.

With the valve in the open position inject the selected cleaning solution into the flow path using a 10 cc syringe. Inject so solution flows from the input to output ports. Repeat as often as necessary, usually 3-4 washes are sufficient. Use an empty syringe to blow air through valve to remove any remaining cleaning solution from the valve interior.

If the valve remains stuck, or continues to leak, after repeated attempts of this cleaning procedure then the valve should be replaced.

Warranty

The **VC-6T Valve Control System** is warranted to be free from defects in materials and workmanship for a period of two years from the date of shipment. If a failure occurs within this period, we will repair or replace the faulty component(s) at our discretion. This warranty does not cover failure or damage caused by physical abuse or electrical stress (e.g., exceeding specified input limits).

Shipping charges to the factory are the customer's responsibility. Return shipping of the repaired unit will be paid by Warner Instruments, Inc.

Specifications

Valve Bracket	**Delrin. Mounts on 3/8” or 1/2” ring stand**	
Valves	**PTFE, 12 VDC /0.25 A to maintain pinch**	
Connection Cable	**2.4 meter (8 ft.) connecting cable terminated with quick disconnects on valve end and 15 pin male "D" type connector on controller end.**	
Tubing	**PTFE, 1/8 OD x 1/16 ID**	
Reservoirs	**60 cc capacity syringes**	
Reservoir Holder	**Delrin. Holds six syringes with thumb screws for each reservoir.**	
Valve Controller		
Switch Selection	***Manual*, *Off* or *External***	
External Input	**+5 V TTL-compatible (BNC Connector)**	
Event Marker	**Logic level pulse 500 ms nominal (rear panel BNC connector)**	
Manifold	**2/1, 4/1 or 6/1 nominal dead space**	
Power	**110-130 or 200-250 VAC, single-phase, 50/60 Hz, 20 watt**	
Operating Temperature	**10-40° C (50-104° F)**	
Dimensions (H x W x D)	**89 x 203 x 305 mm (3.5 x 8.0 x 12 in.)**	
Weight / Shipping Weight	**3.7 kg (8 lb.) / 4.6 kg (10 lb.)**	
Operating conditions	**Equipment is intended to be operated in a controlled laboratory environment.**	**Temperature: 0-40 °c** **Altitude: sea level to 2000 m** **Relative humidity: 0-95%**

Certifications

Declaration of Conformity

CE MARKING (EMC)

Application of Council Directive: 89/336/EEC

Standards To Which Conformity Is Declared:	EN55022 Class A EN61000-3-2 EN61000-3-3 EN50082-1:1992 EN61000-4-2 EN61000-4-3 ENV50204 EN610000-4-4 EN610000-4-8 EN610000-4-11
Manufacturer's Name:	Warner Instruments, LLC
Manufacturer's Address:	1125 Dixwell Avenue Hamden, CT 06514 Tel: (203) 776-0664
Equipment Description:	Valve Controller
Equipment Class:	ITE-Class A
Model Numbers:	VC-6 Controller

I the undersigned, hereby declare that the equipment specified above, conforms to the above Directive(s) and Standard(s).

Place: Hamden, Connecticut USA

Signature:

Full Name: Burton J. Warner

Position: President

Declaration of Conformity

CE MARKING (LVD)

Application of Council Directive: 73/23/EEC

Standards To Which Conformity Is Declared:	EN61010-1:1993
Manufacturer's Name:	Warner Instruments, LLC
Manufacturer's Address:	1125 Dixwell Avenue Hamden, CT 06514 Tel: (203) 776-0664
Equipment Description:	Valve Controller Safety requirements for electrical equipment for measurement and laboratory use
Equipment Class:	Class I
Model Numbers:	VC-6 Controller

I the undersigned, hereby declare that the equipment specified above, conforms to the above Directive(s) and Standard(s).

Place: Hamden, Connecticut USA

Signature:

Full Name: Burton J. Warner

Position: President

WEEE/RoHS Compliance Statement

EU Directives WEEE and RoHS

To Our Valued Customers:

Harvard Apparatus is committed to being a good corporate citizen. As part of that commitment, we strive to maintain an environmentally conscious manufacturing operation. The European Union (EU) has enacted two Directives, the first on product recycling (Waste Electrical and Electronic Equipment, WEEE) and the second limiting the use of certain substances (Restriction on the use of Hazardous Substances, RoHS). Over time, these Directives will be implemented in the national laws of each EU Member State.

Once the final national regulations have been put into place, recycling will be offered for those Harvard Apparatus products which are within the scope of the WEEE Directive. Products falling under the scope of the WEEE Directive available for sale after August 13, 2005 will be identified with a "wheelie bin" symbol.

Two Categories of products covered by the WEEE Directive are currently exempt from the RoHS Directive – Category 8, medical devices (with the exception of implanted or infected products) and Category 9, monitoring and control instruments. Most of Harvard Apparatus' products fall into either Category 8 or 9 and are currently exempt from the RoHS Directive. Harvard Apparatus will continue to monitor the application of the RoHS Directive to its products and will comply with any changes as they apply.

- **Do Not Dispose Product with Municipal Waste.**
- **Special Collection/Disposal Required.**